

## B2.6 (G. Schön / M. Eschrig)

- [B2.6:1] ‡ V. Shelukhin, A. Tsukernik, M. Karpovski, Y. Blum, K.B. Efetov, A.F. Volkov, T. Champel, M. Eschrig, T. Löfwander, G. Schön, and A. Palevski, *Observation of periodic  $\pi$ -phase shifts in ferromagnet-superconductor multilayers*, [Phys. Rev. B \*\*73\*\*, 174506 \(2006\)](#)
- [B2.6:2] ‡ J.C. Cuevas, J. Hammer, J. Kopu, J.K. Viljas, and M. Eschrig, *Proximity effect and multiple Andreev reflections in diffusive SNS junctions*, [Phys. Rev. B \*\*73\*\*, 184505 \(2006\)](#)
- [B2.6:3] ‡ K. Tanaka, D.F. Agterberg, J. Kopu, and M. Eschrig, *Effects of ballistic and diffusive motion of quasiparticles on spectral properties around a vortex in a two-band superconductor*, [Phys. Rev. B \*\*73\*\*, 220501\(R\) \(2006\)](#)
- [B2.6:4] ‡ M. Ternes, W.-D. Schneider, J.C. Cuevas, C.P. Lutz, C.F. Hirjibehedin, and A.J. Heinrich, *Subgap structure in asymmetric superconducting tunnel junctions*, [Phys. Rev. B \*\*74\*\*, 132501 \(2006\)](#)
- [B2.6:5] ‡ M.S. Kalenkov, H. Kloos, and A.D. Zaikin, *Minigap, parity effect, and persistent currents in SNS nanorings*, [Phys. Rev. B \*\*74\*\*, 184502 \(2006\)](#)
- [B2.6:6] ‡ M. Eschrig, T. Löfwander, T. Champel, J.C. Cuevas, J. Kopu, and G. Schön, *Symmetries of pairing correlations in superconductor-ferromagnet nanostructures*, [J. Low Temp. Phys. \*\*147\*\*, 457 \(2007\)](#)
- [B2.6:7] ‡ T. Löfwander, T. Champel, and M. Eschrig, *Phase diagrams of ferromagnet-superconductor multilayers with misaligned exchange fields*, [Phys. Rev. B \*\*75\*\*, 014512 \(2007\)](#)
- [B2.6:8] ‡ M.S. Kalenkov and A.D. Zaikin, *Nonlocal Andreev reflection at high transmissions*, [Phys. Rev. B \*\*75\*\*, 172503 \(2007\)](#)
- [B2.6:9] ‡ K. Tanaka, M. Eschrig, and D.F. Agterberg, *Theory of vortices in hybridized ballistic/diffusive-band superconductors*, [Phys. Rev. B \*\*75\*\*, 214512 \(2007\)](#)
- [B2.6:10] D.S. Golubev and A.D. Zaikin, *Non-local Andreev reflection in superconducting quantum dots*, [Phys. Rev. B \*\*76\*\*, 184510 \(2007\)](#)
- [B2.6:11] ‡ M.S. Kalenkov and A.D. Zaikin, *Crossed Andreev reflection at spin-active interfaces*, [Phys. Rev. B \*\*76\*\*, 224506 \(2007\)](#)
- [B2.6:12] ‡ M.S. Kalenkov and A.D. Zaikin, *Spin-resolved crossed Andreev reflection in ballistic heterostructures*, [Physica E \*\*40\*\*, 147 \(2007\)](#)
- [B2.6:13] ‡ K.Yu. Arutyunov, D.S. Golubev, and A.D. Zaikin, *Superconductivity in one dimension*, [Phys. Rep. \*\*464\*\*, 1 \(2008\)](#)
- [B2.6:14] ‡ M. Eschrig and T. Löfwander, *Triplet supercurrents in clean and disordered half-metallic ferromagnets*, [Nature Phys. \*\*4\*\*, 138 \(2008\)](#)
- [B2.6:15] ‡ T. Champel, T. Löfwander, and M. Eschrig,  *$0$ - $\pi$  transitions in a superconductor/chiral ferromagnet/superconductor junction induced by a homogeneous cycloidal spiral*, [Phys. Rev. Lett. \*\*100\*\*, 077003 \(2008\)](#)
- [B2.6:16] ‡ A.V. Galaktionov, M.S. Kalenkov, and A.D. Zaikin, *Josephson current and Andreev states in superconductor-half metal-superconductor heterostructures*, [Phys. Rev. B \*\*77\*\*, 094520 \(2008\)](#)
- [B2.6:17] ‡ M.S. Kalenkov and A.D. Zaikin, *Non-local electron transport and cross-resistance peak in NSN heterostructures*, [JETP Lett. \*\*87\*\*, 140 \(2008\)](#) [Pis'ma v ZhETF **87**, 166 (2008)]
- [B2.6:18] ‡ A. Vorontsov, I. Vekhter, and M. Eschrig, *Andreev bound states in non-centrosymmetric superconductors*, [Physica B \*\*403\*\*, 1095 \(2008\)](#)

- [B2.6:19] ‡ A.B. Vorontsov, I. Vekhter, and M. Eschrig, *Surface bound states and spin currents in non-centrosymmetric superconductors*, [Phys. Rev. Lett. \*\*101\*\*, 127003 \(2008\)](#)
- [B2.6:20] ‡ A.B. Vorontsov, I. Vekhter, and M. Eschrig, *Surface states in superconductors with no inversion symmetry*, [J. Phys. Soc. Jpn. \*\*77\*\*, Suppl. A, 165 \(2008\)](#)
- [B2.6:21] ‡ J. Linder, T. Yokoyama, A. Sudbo, and M. Eschrig, *Pairing Symmetry Conversion by Spin-Active Interfaces in Magnetic Normal-Metal-Superconductor Junctions*, [Phys. Rev. Lett. \*\*102\*\*, 107008 \(2009\)](#)
- [B2.6:22] ‡ M. Eschrig, *Superconductor-Metal Heterostructures: Coherent conductors at a distance*, [Nature Physics \*\*5\*\*, 384 \(2009\)](#)
- [B2.6:23] ‡ R. Grein, M. Eschrig, G. Metalidis, and G. Schön, *Spin-Dependent Cooper Pair Phase and Pure Spin Supercurrents in Strongly Polarized Ferromagnets*, [Phys. Rev. Lett. \*\*102\*\*, 227005 \(2009\)](#)
- [B2.6:24] ‡ D.S. Golubev, M.S. Kalenkov, and A.D. Zaikin, *Crossed Andreev reflection and charge imbalance in diffusive Normal-Superconducting-Normal structures*, [Phys. Rev. Lett. \*\*103\*\*, 067006 \(2009\)](#)
- [B2.6:25] D.S. Golubev and A.D. Zaikin, *Non-local Andreev reflection under ac bias*, [Europhys. Lett. \*\*86\*\*, 37009 \(2009\)](#)
- [B2.6:26] ‡ M. Eschrig, *Scattering problem in nonequilibrium quasiclassical theory of metals and superconductors: General boundary conditions and applications*, [Phys. Rev. B \*\*80\*\*, 134511 \(2009\)](#)
- [B2.6:27] ‡ R. Grein, T. Löfwander, G. Metalidis, and M. Eschrig, *Theory of superconductor-ferromagnet point-contact spectra: The case of strong spin polarization*, [Phys. Rev. B \*\*81\*\*, 094508 \(2010\)](#)
- [B2.6:28] ‡ J. Linder, A. Sudbø, T. Yokoyama, R. Grein, and M. Eschrig, *Signature of odd-frequency pairing correlations induced by a magnetic interface*, [Phys. Rev. B \*\*81\*\*, 214504 \(2010\)](#)
- [B2.6:29] G. Metalidis, M. Eschrig, R. Grein, and G. Schön, *Nonlocal conductance via overlapping Andreev bound states in ferromagnet-superconductor heterostructures*, [Phys. Rev. B \*\*82\*\*, 180503\(R\) \(2010\)](#)
- [B2.6:30] A. Kleine, A. Baumgartner, J. Trbovic, D.S. Golubev, A.D. Zaikin, and C. Schönenberger, *Magnetic field and contact resistance dependence of non-local charge imbalance*, [Nanotechnology \*\*21\*\*, 274002 \(2010\)](#)
- [B2.6:31] D.S. Golubev and A.D. Zaikin, *Shot noise and Coulomb effects on nonlocal electron transport in normal-metal/superconductor/normal-metal heterostructures*, [Phys. Rev. B \*\*82\*\*, 134508 \(2010\)](#)
- [B2.6:32] ‡ M. Eschrig, C. Iniotakis, and Y. Tanaka, *Theoretical aspects of Andreev spectroscopy and tunneling spectroscopy in non-centrosymmetric superconductors: a topical review*, Chapter in book on “Non-centrosymmetric Superconductivity”, edited by M. Sigrist and E. Bauer, to appear in Springer Verlag, arXiv:1001.2486 [cond-mat.supr-con]
- [B2.6:33] ‡ T. Löfwander, R. Grein, and M. Eschrig, *Is CrO<sub>2</sub> Fully Spin-Polarized? Analysis of Andreev Spectra and Excess Current*, [Phys. Rev. Lett. \*\*105\*\*, 207001 \(2010\)](#)
- [B2.6:34] ‡ A. Kleine, A. Baumgartner, J. Trbovic, D.S. Golubev, A.D. Zaikin, and C. Schönenberger, *Magnetic field and contact resistance dependence of non-local charge imbalance*, [Nanotechnol. \*\*21\*\*, 274002 \(2010\)](#)
- [B2.6:35] ‡ S. Piano, R. Grein, C.J. Mellor, K. Vyborny, R. Campion, M. Wang, M. Eschrig, and B. L. Gallagher, *Spin polarization of (Ga,Mn)As measured by Andreev*

- Spectroscopy: The role of spin-active scattering*, [Phys. Rev. B \*\*83\*\*, 0871305\(R\) \(2011\)](#)
- [B2.6:36] A. Heimes, R. Grein, and M. Eschrig, *Electronic dispersion anomalies in iron pnictide superconductors*, [Phys. Rev. Lett. \*\*106\*\*, 047003 \(2011\)](#)
- [B2.6:37] ‡ M. Eschrig, C. Iniotakis, and Y. Tanaka, *Theoretical aspects of Andreev spectroscopy and tunneling spectroscopy in non-centrosymmetric superconductors: a topical review*, in "Non-centrosymmetric Superconductivity", Bauer, E. & Sigrist, M. (eds.), Vol. 847, 2012 ed. Berlin and Heidelberg: Springer-Verlag p. 313-357 (Lecture Notes in Physics)
- [B2.6:38] ‡ A. Heimes, R. Grein, and M. Eschrig, *Effect of spin fluctuations on the electronic structure in iron based superconductors*, Phys. Rev. B **86**, 064528 (2012)
- [B2.6:39] ‡ R. Grein, J. Michelsen, and M. Eschrig, *A numerical study of the superconducting proximity effect in topological surface states*, J. Phys.: Conf. Ser. **391**, 012149 (2012)
- [B2.6:40] M. Eschrig, C. Iniotakis and S. Tanaka, *Theoretical aspects of Andreev spectroscopy and tunneling spectroscopy in non-centrosymmetric superconductors: a topical review* in "Non-centrosymmetric Superconductivity", Bauer, E. & Sigrist, M. (eds.), Vol. 847, 2012 ed. Berlin and Heidelberg : Springer-Verlag pp. 313-357 (Lecture Notes in Physics)
- [B2.6:41] ‡ D. Gustafsson, D.S. Golubev, M. Fogelström, T. Claeson, S.E. Kubatkin, T. Bauch, and F. Lombardi, *Fully gapped superconductivity in a nanometre-size  $YBa_2Cu_3O_{7-\delta}$  island enhanced by a magnetic field*, Nature Nanotechnology **8**, 25 (2013)
- [B2.6:42] J. Michelsen and R. Grein, *Superconducting proximity effect in semiconductor thin films with spin-splitting and spin-orbit interaction*, arXiv:1208.1090
- [B2.6:43] P. Kotetes, *Classification of engineered topological superconductors*, New J. Phys. **15**, 105027 (2013)
- [B2.6:44] ‡ D.S. Golubev, T. Faivre, J.P. Pekola, and A. Aassime, *Heat transport through a Josephson junction*, Phys. Rev. B **87**, 094522 (2013)
- [B2.6:45] \*‡ J. Zimmer, N. Vogt , A. Fiebig, S.V. Syzranov, A. Lukashenko, R. Schäfer, H. Rotzinger, A. Shnirman, M. Marthaler, and A.V. Ustinov, *Thermally activated conductance in arrays of small Josephson junctions*, Phys. Rev. B **88**, 144506 (2013)
- [B2.6:46] \* S. Kolenda, M.J. Wolf, D.S. Golubev, A.D. Zaikin, and D. Beckmann, *Nonlocal transport and heating in superconductors under dual-bias conditions*, Phys. Rev. B **88**, 174509 (2013)
- [B2.6:47] ‡ A.M. Black-Schaffer, D.S. Golubev, T. Bauch, F. Lombardi, and M. Fogelström, *Model Evidence of a Superconducting State with a Full Energy Gap in Small Cuprate Islands*, Phys. Rev. Lett. **110**, 197001 (2013)

### Invited Talks at International Conferences

M. Eschrig, *Coexistence of and Competition between Magnetism and Superconductivity*, APS March meeting, Baltimore, USA, March 16, 2006

M. Eschrig, *Unconventional proximity effect in superconductor/ferromagnet hybrid structures*, Symposium "Quantum Phenomena at Low Temperatures", Lammi, Finland, April 25, 2006

A.D.Zaikin, *Quantum phase slips in superconducting nanowires*, Workshop on Quantum Effects in Nanoobjects; Jena, Germany, April 28, 2006

J.C. Cuevas, *Electronic transport in superconducting nanostructures*, International Conference on Nanoscience: ICON-Venezuela 2006, Choroni, Venezuela, May 7-11, 2006

M. Eschrig, *SFS-Junctions and Proximity Effects*, panelist in the Workshop on Basic Research Needs for Superconductivity, Department of Energy, Office of Basic Energy Sciences, Washington, D.C. May 7-11, 2006

M. Eschrig, *Triplet supercurrents in half metals and unconventional proximity effects*, Advanced Research Workshop "Meso-06" on Nanoscale Superconductivity and Magnetism, Chernogolovka, Russia, June 14-19, 2006

G. Schön, *Transport through superconductor - ferromagnet heterostructures*, M2S-HTSC VIII, 8th Int. Conference on Materials and Mechanisms of Superconductivity and High Temperature Superconductors, Dresden, July 10 – 14, 2006

M. Eschrig, *Unconventional proximity effects in superconductor/ferromagnet hybrids*, Workshop on "Mesoscopic Superconductivity and Magnetism", Chicago, Illinois, USA, August 28-September 1, 2006

A.D. Zaikin, *Quantum phase slips in ultra-narrow superconducting wires*, Intern. Workshop and School on Quantum Transport and Noise, Ermones, Greece, September 4-15, 2006

M. Eschrig, *Triplet Supercurrents in Half Metals: the Role of Disorder*, Workshop on "Interplay between Superconductivity and Magnetism", Asia Pacific Center for Theoretical Physics, Seoul, Korea, November 8-10, 2006

J.C. Cuevas, *Proximity effect and multiple Andreev reflections in diffusive SNS junctions*, 374. Wilhelm und Else Heraeus Seminar on "Spin Physics of Superconducting Heterostructures", Bad Honnef, Germany, December 9-13, 2006

M. Eschrig, *Triplet Pairing Correlations in Superconductor/Ferromagnet heterostructures*, Heraeus Workshop "Spin physics of superconductors", Bad Honnef, Germany, December 9-13, 2006

J.C. Cuevas, *Magnetic interference patterns and vortices in diffusive SNS junctions*, Workshop on "Physics of Nanoscale Superconducting Heterostructures", Leiden, The Netherlands, July 2-6, 2007

M. Eschrig, *Properties of Heterostructures involving Superconductors and Half-Metallic Ferromagnets*, Workshop "Physics of nanoscale superconducting heterostructures", Lorentz Center Leiden, Netherlands, July 2-6, 2007

A.D. Zaikin, *Crossed Andreev reflection in ballistic heterostructures*, Intern. Workshop "Physics of Nanoscale Superconducting Heterostructures", Leiden, The Netherlands, July 2-6, 2007

M. Eschrig, *Superconductor/Half-metal Nanostructures*, International Symposium "Nanoscale Phenomena - Fundamentals and Applications", Academy of Sciences of Moldova, Kishinev, Moldova, September 20-22, 2007

M. Eschrig, *Interface physics in Superconductor/Ferromagnet devices*, International Workshop "Spintronics with superconductors", Ruhr-University Bochum, November 8-9, 2007

J.C. Cuevas, *Magnetic interference patterns and vortices in diffusive SNS junctions*, Workshop on the "Physics of Nanostructures and Nanomaterials", San Carlos de Bariloche, Argentina, December 9-12, 2007

M. Eschrig, *Dynamical response of vortex cores in quasi-twodimensional superconductors*, 4th CREST Nano-Virtual-Labs Joint Workshop on Superconductivity 2007 "Critical Currents", Kita-Kyushu, Japan, December 17-18, 2007

A.D. Zaikin, *Spin-resolved crossed Andreev reflection*, XXXVIIth Rencontres de Moriond Intern. Conference "Quantum Transport and Nanophysics", La Thuile, Italy, March 8-15, 2008

A.D. Zaikin, *Spin-resolved crossed Andreev reflection*, Joint Int. Workshop on "A new generation of ultra-sensitive detectors for dark energy and cosmology experiments", Bjorkliden - Kiruna, Sweden, March 30 - April 6, 2008

M. Eschrig, *Andreev bound states and spin currents near a surface of a non-centrosymmetric superconductor*, International Workshop "Non-Centrosymmetric Superconductors", ETH Zürich, May 30-31, 2008

M. Eschrig, *Triplet supercurrents through half-metallic ferromagnets*, International Workshop on "Probing superconductivity at the nanoscale", held in the framework of the European Science Foundation programme "Nanoscience Engineering and Superconductivity", Alicante, Spain, June 4-7, 2008

A.D. Zaikin, *Superconductivity at the nanoscale*, Intern. Summer Physics School, Lovcen, Montenegro, August 24-31, 2008

A.D. Zaikin, *Quantum fluctuations in nanowires and nanorings*, Intern. Conference on Quantum Transport and Fluctuations at Nanoscale (QTF Nano 2008), Przno, St. Stefan, Montenegro, August 31 – September 5, 2008

A.D. Zaikin, *Superconducting fluctuations in nanowires and nanorings*, 420. WE-Heraeus-Seminar: "Unconventional Proximity Effects in Novel Materials", Bad Honnef, Germany, October 13-15, 2008

M. Eschrig, *Unconventional Superconductivity induced by Interfaces and Surfaces*, Annual Meeting of the German Physical Society (DPG) in Dresden, Germany, March 25, 2009

M. Eschrig, *Surface properties of non-centrosymmetric superconductors*, International Workshop on "New Developments in Theory of Superconductivity", Institute for Solid State Physics, University of Tokyo, Japan, June 22-July 10, 2009.

M. Eschrig, *Crossed Cooper Pair Transmission and Pure Spin Supercurrents through Strongly Spin-polarized Ferromagnets*, International Conference on Quantum Fluids and Solids QFS2009, Northwestern University, Evanston, USA, August 5-12, 2009

M. Eschrig, *Spin polarized transport in hybrid structures*, Invited Lecturer at CFN Summer School "Nanoelectronics", Bad Herrenalb, Germany, 4-7 September 2009

M. Eschrig, *Equal Spin Pairing and Transport in Superconductor-Ferromagnet Junctions*, International Symposium "Novel Spin Pairing 2009", Kyoto, Japan, 13-16 September 2009

M. Eschrig, *Spin supercurrents and crossed pair transmission in S/F hybrid structures with strong spin polarization*, Plenary Lecture at International Workshop "NANO-2009", Humboldt Kolleg, Kishinev, Moldova, 17-20 September 2009

M. Eschrig, *Crossed Cooper Pair Transmission and Pure Spin Supercurrents through Strongly Spin-polarized Ferromagnets*, Invited talk at APS March meeting 2010, Portland, Oregon, U.S.A, 16 March, 2010

M. Eschrig, *Unconventional superconducting heterostructures*, ITN Meeting on "Nanoelectronics - Concepts, Theory and Modeling", Jacobs University Bremen, Germany, May 17- 21, 2010

M. Eschrig, *Nonlocal effects in superconducting heterostructures*, SM-2010 conference on "Hybrid proximity nanostructures and intrinsic phenomena", Paestum, Italy, 9 Sept. 2010

G. Metalidis, *Nano-local conductance via overlapping Andreev bound states in ferromagnet-superconductor heterostructures*, Nano-CTM Annual Network Meeting, Malvern, United Kingdom, 16-17. Sept. 2010

R. Grein, *Andreev spectroscopy in (Ga,Mn)As*, Nano-CTM Annual Network Meeting, Malvern, United Kingdom, 16-17. Sept. 2010

A. Heimes, *Electronic dispersion anomalies in iron-pnictide superconductors*, Spring Meeting of the Deutsche Physikalische Gesellschaft, Dresden, Germany, 16. Mar. 2011

P. Kotetes, *Spinful Kitaev model for spin-singlet topological superconductors and magnetically tunable  $4\pi$ -periodic Josephson transport*, NanoCTM Meeting, North Uist (UK) 20-23 May 2013

P. Kotetes, *Tailoring topological superconductivity using supercurrents*, NanoCTM Meeting, Wasowo (Poland) 23-27 Sept. 2013

D. Heim (Germany) M. Safonchik (Ioffe Institute RAS, Sankt-Petersburg). In collaboration with Thierry Champel (LPMMC), Mike Zhitomirsky (CEA Grenoble), M. Eschrig (RHUL. London), Claudine Lacroix (Neel, Grenoble), SF proximity effect and FFLO states. What happens when the Cooper pair  $\hat{\psi}^{\dagger}\hat{\psi}$  penetrates into F? In F the sum momentum of the pair  $\hat{\psi}^{\dagger}\hat{\psi}$  cannot be zero.  $k_F\hat{\psi}^{\dagger}\hat{\psi} \sim k_F\hat{\psi}^{\dagger}, k_F\hat{\psi}^{\dagger} - k_F\hat{\psi} \sim \hbar, \hbar$  - exchange field,  $mB\hbar > D$ , nonzero pair momentum.